Check

Step 1:

$$\begin{array}{rl} \$600 & \text{Marked selling price} \\ \times\ 0.30 & \text{Discount \%} \\ \hline \$180 & \text{Discount} \end{array}$$

Step 2:

$$\begin{array}{rl} \$600 & \text{Marked selling price} \\ -\ \$180 & \text{Discount} \\ \hline \$420 & \text{Actual selling price} \end{array}$$

Step 3:

$$\begin{array}{rl} \$420 & \text{Actual selling price} \\ -\ \$350 & \text{Cost} \\ \hline \$70 & \text{Profit} \end{array}$$

As a double check,

$$\begin{array}{rl} \$350 & \text{Cost} \\ \times\ 0.20 & \text{Profit \%} \\ \hline \$70 & \text{Profit} \end{array}$$

Now work margin exercise 8.

Margin Exercise Answers

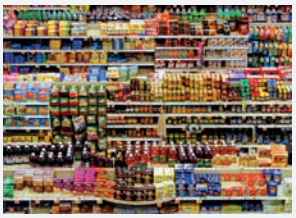
1. 64 **2.** −5 **3.** $2800 **4.** Bagpipes: $288.85, Kilt: $218.45 **5.** 2 hours **6.** First part took $\frac{4}{3}$ or $1\frac{1}{3}$ hours; Second part took $\frac{8}{3}$ or $2\frac{2}{3}$ hours. **7.** 53 **8.** $2300

2.4 Exercises

Concept Check

Fill-in-the-Blank. Complete the sentences using information found in this section.

1. Word problems are designed to teach you to _____ carefully and to _____ clearly.
2. Word problems generally do not give specific _____.
3. After solving a word problem, you should check to see if your _____ seems reasonable.
4. The average of a set of numbers can be found by _____ the numbers and then _____ by the quantities of numbers in the set.
5. To calculate distance, find the product of the _____ and _____.
6. When solving distance-rate-time problems, a _____ or _____ showing the known and unknown values is helpful.



Comparing Wholesale and Retail Prices

In business, understanding the difference between the wholesale price and the retail price can mean success or failure. The wholesale price is the amount that a store pays to purchase items. The retail price is the amount the customer pays to purchase the item. The difference between the retail price and wholesale price is called the retail markup. This markup is used to pay the overhead of the business (things like utilities, employee salary, insurance, and so on). Profit or loss is determined by the amount of money left after paying the overhead.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. In the distance-rate-time formula $d = r \cdot t$, the value t stands for the time spent traveling.

8. The concept of average can be used to find unknown numbers.

9. The first step to solving word problems is to draw any type of figures or diagram that might be helpful.

10. Translating English phrases into algebraic expressions can be used to solve number problems.

Practice

Read each problem carefully, translate the various phrases into algebraic expressions, set up an equation, and solve the equation. See Examples 1 and 2.

1. Five less than a number is equal to 13 decreased by the number. Find the number.

2. Three less than twice a number is equal to the number. What is the number?

3. Thirty-six is 4 more than twice a certain number. Find the number.

4. Fifteen decreased by twice a number is 27. Find the number.

5. Seven times a certain number is equal to the sum of twice the number and 35. What is the number?

6. The difference between twice a number and 3 is equal to 6 decreased by the number. Find the number.

7. Fourteen more than 3 times a number is equal to 6 decreased by the number. Find the number.

8. Two added to the quotient of a number and 7 is equal to −3. What is the number?

9. The quotient of twice a number and 5 is equal to the number increased by 6. What is the number?

10. Three times the sum of a number and 4 is equal to −9. Find the number.

11. Four times the difference between a number and 5 is equal to the number increased by 4. What is the number?

12. When 17 is added to 6 times a number, the result is equal to 1 plus twice the number. What is the number?

13. If the sum of twice a number and 5 is divided by 11, the result is equal to the difference between 4 and the number. Find the number.

14. If the difference between a number and 21 is divided by 2, the result is 4 times the number. What is the number?

15. Twice a number increased by 3 times the number is equal to 4 times the sum of the number and 3. Find the number.

16. Twice the difference between a number and 10 is equal to 6 times the number plus 16. What is the number?

Applications

Solve.

17. A mathematics student bought a calculator and a textbook for a course in statistics. If the textbook costs $67.51 more than the calculator, and the total cost for both was $329.49, what was the cost of each item?

18. The total cost of a computer flash drive and an all-in-one printer was $96.94, including tax. If the cost of the flash drive was $58.96 less than the printer, what was the cost of each item?

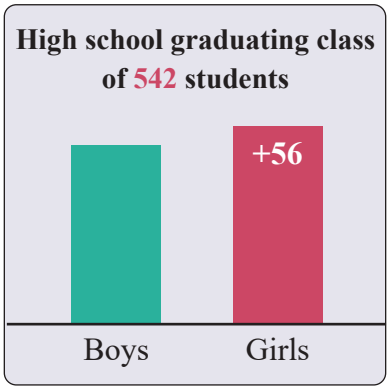
19. A real estate agent says that the current value of a 25-year old home is $90,000 more than twice its value when it was new. If the current value is $310,000, what was the value of the home when it was new?

20. On average the number of electric guitars sold in Texas each year is 91,399, which is seven times the average number of guitars sold each year in Wyoming. How many electric guitars, on average, are sold each year in Wyoming?

21. A classic car is now selling for $1500 more than three times its original price. If the selling price is now $12,000, what was the car's original price?

22. On August 24, the Fernandez family received 19 pieces of mail, consisting of magazines, bills, letters, and ads. If they received the same number of magazines as letters, three more bills than letters, and five more ads than bills, how many magazines did they receive?

23. A high school graduating class is made up of 542 students. If there are 56 more girls than boys, how many boys are in the class?



24. Lucinda bought two buckets of golf balls for the driving range. She gave the pro-shop clerk a 50-dollar bill and received $10.50 in change. What was the cost of one bucket of golf balls? (Tax was included.)

25. A guitar manufacturer spent $158 million on the production of acoustic and electric guitars last year. If the amount the company spent producing acoustic

guitars was $68 million more than it spent on producing electric guitars, how much did the company spend producing electric guitars?

26. The cost to rent a ballroom at a convention center for one day is $800 for the first 2 hours. Every additional hour that the ballroom is in use costs an additional $50 per hour, which is used to cover security fees. If you owe $1450 for a one-day rental of the ballroom, how many hours did you use the ballroom?

27. The cost to rent a party room at an arcade is a fixed price per hour plus $15 per child. If a 3-hour room rental with 20 children costs $330, what is the fixed price per hour for the room rental?

28. A-to-Z Truck Rentals charges $19.99 per day plus 65¢ per mile driven to rent a pick-up truck. For a one day trip, Louis paid a rental fee of $127.24. How many miles did he drive?

29. Dana finds the perfect dress for the Freshman Dance on sale at Belk. If she paid $95.96 for the dress on sale (before tax) and the dress was marked 20% off, find the original price of the dress.

- **a.** Is the 20% marked off the price she paid, or the original price?
- **b.** How do you represent the original price; the amount of the discount?
- **c.** Set up an equation and solve for the original price of the dress.

30. Two bicyclists, Chantelle and Taylor, start from opposite ends of a 19-mile-long bike path. Taylor rides her bike 6 mph faster than Chantelle, and the cyclists meet in 30 minutes. How fast was each of them riding? Draw a picture to represent the described problem.

- **a.** Use a table to organize the information given in the problem.
- **b.** Write an equation based on your diagram and/or table.
- **c.** Solve the equation and relate your answer to the original problem.

31. Two planes which are 2475 miles apart fly toward each other. Their speeds differ by 75 mph. If they pass each other in 3 hours, what is the speed of each?

32. Marcus drives from Chicago to Detroit in 6 hours. On the return trip, his speed is increased by 10 mph and the trip takes 5 hours. Find his rate on the return trip. How far apart are the towns?

33. Tim and Barb have 8 hours to spend on a mountain hike. They can walk up the trail at an average rate of 2 mph and can walk down at an average rate of 3 mph. How long should they plan to hike uphill before turning around?

34. The Reeds are moving across Texas. Mr. Reed leaves $3\frac{1}{2}$ hours before Mrs. Reed. If his average speed is 40 mph and her average speed is 60 mph, how long will Mrs. Reed have to drive before she overtakes Mr. Reed?

35. After traveling for 40 minutes, Mr. Koole had to slow to $\frac{2}{3}$ his original speed for the rest of the trip due to heavy traffic. The total trip of 84 miles took 2 hours. Find his original speed.

36. A train leaves Cincinnati at 2:00 p.m. A second train leaves the same station in the same direction at 4:00 p.m. The second train travels 24 mph faster than the first. If the second train overtakes the first at 7:00 p.m., what is the speed of each of the two trains?

37. Maria runs through the countryside at a rate of 10 mph. She returns along the same route at 6 mph. If the total trip took 1 hour 36 minutes, how far did she run in total?

38. Mr. Kent drove to a conference. The first half of the trip took 3 hours due to traffic. Traffic let up for the second half of the trip and he was able to increase his speed by 20 mph to make sure he got there on time. Find his rates of speed if he traveled 2 hours at the second rate.

39. Jayden walked to his friend's house at a rate of 4 mph to borrow his friend's bicycle. Coming back home, he rode the bicycle at an average rate of 12 mph. The total time for the round trip was 1 hour 30 minutes. How far away does Jayden's friend live?

40. Once a week, Felicia walks/runs for a total of 6 miles. Felicia spends twice as much time walking as she does running. If she walks at a rate of 4 mph and runs three times faster than she walks, what is the time for each part?

41. Achilles is racing a tortoise and gives him a 2-hour head start. The tortoise runs at a pace of 10 miles per hour and Achilles runs at a pace of 25 miles per hour. How long will it take Achilles to catch up to the tortoise?

a. Fill out the $d = r \cdot t$ table. Let the variable t represent the amount of time that the tortoise has traveled.

	Rate (mph)	·	Time (min)	=	Distance (miles)
Tortoise					
Achilles					

b. When Achilles catches up to the tortoise, they will have traveled the same distance. Set up a linear equation using the information in the table.

c. Solve the equation from Part **b.** for the variable.

d. How long will it take Achilles to catch up to the tortoise?

e. If the race is 35 miles long, will Achilles pass the tortoise before crossing the finish line? Show work to support your answer.

42. Marissa has five exam scores of 75, 82, 90, 85, and 77 in her chemistry class. What score does she need on the final exam to have an average grade of 80 (and thus earn a grade of B)? (All exams have a maximum of 100 points.)

43. Gerald had scores of 80, 92, 89, and 95 on four exams in his algebra class. What score will he need on his fifth exam to have an overall average grade of 90? (All exams have a maximum of 100 points.)

44. While riding her bike to the park and back home five times, Stacey timed herself at 60 min, 62 min, 55 min (the wind was helping), 58 min, and 63 min. She had set a goal of having an average time of 60 minutes for her rides. How many minutes will she need on her sixth ride to attain her goal?

45. For every 4-week period, Lauren wants to make an average of 6 phone calls per week from her prepaid cell phone. The first week she made 9 phone calls; the second week she made 6 phone calls, and the third week 5 phone calls. How many phone calls does Lauren need to make in the fourth week to make sure she stays on track with her goal?

46. While growing up, Jason was allowed to watch TV an average of 3 hours a day over a one-week period. One particular week he watched 1 hour, 2 hours, 1 hour, 3 hours, 3 hours, and 5 hours. How many hours could Jason watch the seventh and last day of the week and still obey his parents?

47. A college student realized that he was spending too much money on video games. For the remaining 5 months of the year, his goal is to spend an average of $50 a month towards his hobby. How much can he spend in December, taking into consideration that the other 4 months he spent $70, $25, $105, $30, respectively?

48. Wade has scores of 59, 68, 76, 84, and 69 on the first five tests in his social studies class. He knows that the final exam counts as two tests. What score will he need on the final to have an average of 70? (All tests and exams have a maximum of 100 points.)

49. A statistics student has grades of 86, 91, 95, and 76 on four hour-long exams. What score must he receive on the final exam to have an average grade of 90 if:

a. the final is equivalent to a single hour-long exam (100 points maximum)?

b. the final is equivalent to two hour-long exams (200 points maximum)?

50. Kevin consulted a dietician who told him to consume an average of 2100 calories per day based on his age, current weight, activity level, and weight goals. Kevin kept track of his calorie intake for several days. He consumed 2050 calories on Monday, 2200 calories on Tuesday, 2300 calories on Wednesday, and 2400 calories on Thursday. How many calories would he need to consume on Friday to have an average calorie intake of 2100 for the five days?

a. Set up an equation to solve for the amount of calories Kevin would need to consume on Friday. Use the variable x to represent the number of calories needed.

b. Solve the equation from Part **a.** for the variable.

c. It is recommended that active men consume more than 1500 calories per day to avoid triggering "starvation mode" in the body. Can Kevin stay above this calorie amount and meet his recommended average for the 5 days?

d. Do you think this is a smart way for Kevin to adjust his average calorie intake? If not, what are some alternatives?

Writing & Thinking

The following problem is given with an incorrect answer. Explain how you can tell that the answer is incorrect without needing to solve the problem or do any algebra; then, solve the problem correctly.

51. Kareem can paddle his kayak at 6 mph in still water. He decides to go kayaking on the local river. He paddles downriver (with the current) for 2 hours; then he turns around and paddles upriver (against the current) for 2.5 hours, returning to his starting point. How fast is the current in the river? **Incorrect answer: 27 mph**